

VARIABILITY IN THE SAND CRAB *PORTUNUS PELAGICUS*  
(LINNAEUS) (CRUSTACEA: PORTUNIDAE)

W. STEPHENSON

Department of Zoology, University of Queensland

SUMMARY

An unusual male of *P. pelagicus* is described. It differs from more typical specimens in twelve non-pigmentary, and four pigmentary features and in three of the latter resembles *P. trituberculatus*. There appears to be complete gradation to typical Queensland male specimens.

Differences in pigmentation between male *P. pelagicus* from different areas within its wide distributional range are commented upon.

Recent work to be published elsewhere (Stephenson in MS) involves detailed studies of pigmentation of large numbers of local sand crabs. Amongst the initial collections a single large male differed sufficiently in pigmentation and other features to be regarded tentatively as an undescribed species. While collection of additional material showed a gradation to typical forms, description of the extreme variant is considered necessary for four reasons:

- (1) to prevent the possible creation of an additional synonym by future workers,
- (2) to indicate an unexpected variability which has already had implications upon an attempt at numerical taxonomy (Stephenson, Williams and Lance 1968),
- (3) to focus attention on possible geographic variation in the species, which is commented upon in the Discussion, and
- (4) the specimen partly bridges the gap between *P. pelagicus* and *P. trituberculatus* (Miers).

Throughout carapace breadths, measured by dial calipers, include the last anterolateral teeth, and are given to the nearest 1 mm.

All specimens have been deposited in the Queensland Museum.

DESCRIPTION OF UNUSUAL MALE (Fig. 1A, B, C; pl. 11A)

Male (c. 159 mm), trawled in shallow muddy grounds nr. St. Helena I., Moreton Bay by University Trawler "Wanderer II" (Mr. L. Wale), 15-25/viii/1966, Qd Mus. W. 2517.

EPISTOME: Stout projecting spine.

FRONT: With two rounded median lobes, and two sharp lateral teeth.

ORBITAL REGION: Inner orbital angle a sharp tooth. Upper border of orbit with deep but almost closed inner fissure, and open outer fissure. Region between these fissures almost bilobed. Suborbital fissure distinct. Suborbital border without hirsute margin (probably due to wear).

ANTEROLATERAL TEETH: First larger than those immediately after, remainder about equally sharp but increasing in basal width from second to eighth. Ninth very large and projecting straight out laterally.

CARAPACE: Very broad ( $B/L = 2.15$ ), anterolateral borders forming broad arc with centre behind posterior border of carapace, postlateral junctions smoothly curved. Surface shining and granular except in postfrontal regions, bearing granular ridges, of which epibranchials are distinct, mesogastrics barely recognisable, and metogastrics are recognisable. Cardiac regions more densely granular than most of carapace, with granulation on the two sides almost confluent.

CHELIPEDS: (Left only present). Elongate, massive, spinous and ridged; under surface with faint corrugations. Under surface of arm terminating distally in stout rounded tubercle, upper surface with single posterodistal spine, and with five curved, sharp, stout anterior spines, the four distal being equally sized and spaced, and the proximal smaller and relatively close to its neighbour. Wrist with sharp outer and inner spines, the latter relatively short, both terminating carinae; three additional carinae on upper surface; anteroexternal border with rounded tubercle near its middle; angle between anteroexternal and anterointernal borders relatively obtuse. Upper surface of hand with stout spine at wrist articulation, and with three very conspicuous granular carinae:—(1) outer, separating upper from outer surface of hand, (2) subcentral, terminating in stout spine, and (3) inner, separating upper from inner surface of hand, also terminating in stout spine. Outer surface of hand

with acute, moderately finely granular central carina, and rounded feebly developed lower carina. Inner surface of hand with well-developed, smooth central carinae, terminating in spine. Fingers long, carinate and moderately strongly grooved with numerous rounded teeth.

**WALKING LEGS:** Inner margins of propodus and dactylus bearing thick fringe of hairs.

**FIFTH LEG:** With fringes of hairs on anterior edges of carpus, merus, and propodus, and to a lesser extent (? wear) on dactylus; also on posterior and posterodistal margins of propodus. No spines or spinules on posterior borders of segments.

**THIRD MAXILLIPED:** Anteroexternal angle of merus not produced laterally, upper surface of merus devoid of hairs. Anterior border with sparse hairs only (? wear).

**MALE ABDOMEN:** Gradually tapering, penultimate segment elongate but relatively broad basally, ultimate segment about as long as broad.

**MALE FIRST PLEPOD:** As described by Stephenson and Campbell (1959) excepting that the arrangement of longer and stouter subterminal bristles roughly alternating with shorter and thinner bristles is less obvious.

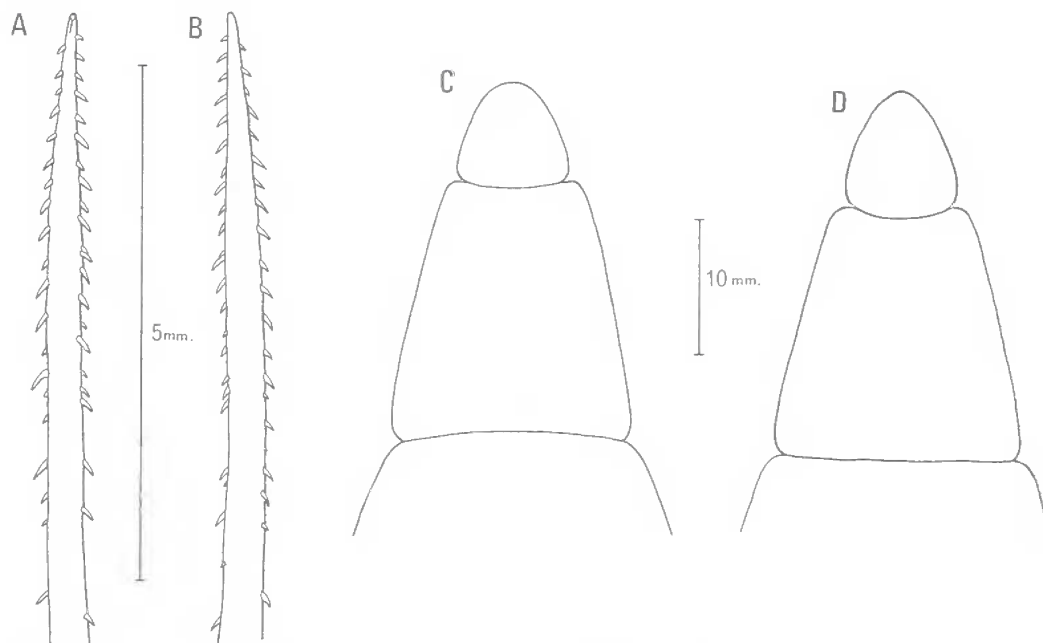


FIG. 1: A, B. Male first pleopod of unusual male (Qd Mus. W 2517); A, upper surface. B, under surface. C. Abdomen of above specimen. D. Abdomen of typical male (Qd Mus. W 2518).

COLOUR: After approximately four days in formalin predominantly dark purple red with lighter brownish purple in cardiac and mesobranchial portions of carapace.

Carapace: Somewhat sparsely mottled with pale blue areas outlined in dark brownish purple. The most conspicuous light marks are reniform spots in each post-lateral area with indistinct linear continuations towards cardiac region. Indistinct row of light spots behind frontal and anterolateral borders, terminating between sixth and seventh anterolateral teeth. Gastric and cardiac regions sparsely outlined with light blotches, becoming a conspicuous W mark in gastro-cardiac boundary. Small blotches near centre of epibranchial ridge. Near posterior border moderately dense mottling.

Chelipeds: Upper surface of arm with small white spots, sparsely arranged; anterior surface transversely divided into lilac upper distal half and ivory lower proximal half; lower surface ivory. Upper surface of wrist with numerous small white spots, outer surface with spots and patches of white, under surface white. Upper surface of hand between two inner carinae uniformly purple, between two outer carinae with two irregular lines of white spots; outer surface between two upper carinae with small white blotches on red purple background, and with pink and deep purple blotch at articulation of movable finger, lower portion white; inner surface between two upper carinae with numerous small white blotches on red purple background, and with conspicuous partly pink, partly deep purple, blotch at articulation of movable finger, lower portion cream bordered by blue-purple; under surface white externally and blue-purple with white spots internally. Finger predominantly blue-purple, without white mottling. Outer surfaces becoming pink towards the teeth and ivory towards articulation of movable finger.

Walking Legs: Upper surfaces of meri with small inconspicuous white spots.

Fifth Leg: Upper surfaces of merus and ischium with moderate numbers of white blotches.

#### DIFFERENCES FROM MORE TYPICAL LOCAL MALES (Fig. 1D; pl. 11B)

Comparisons are with similar sized specimens collected and preserved similarly (W2518 – W2523), with one specimen illustrated (W2518).

#### A. Non pigmentary features

- (1) Epistome stouter.
- (2) Median frontal lobes more rounded than in most *P. pelagicus*.
- (3) Orbit: upper border with inner fissure almost completely closed.
- (4) Cheliped arm: anterior border with five against typically four spines.
- (5) Cheliped wrist: inner spine relatively short.
- (6) Cheliped wrist: anteroexternal border with spine or spinule.
- (7) Cheliped wrist: angle between anteroexternal and anterointernal borders relatively obtuse.

- (8) Cheliped hand, outer surface: lower carina relatively feebly developed.
- (9) Cheliped hand, fingers: grooves only moderately well-developed.
- (10) Male abdomen: penultimate segment relatively broad basally.
- (11) Male abdomen: ultimate segment relatively short.
- (12) Male first pleopod, subterminal armature: two types of bristles less easy to distinguish.

#### B. Pigmentation

Comparison should be made between the description of the unusual specimen and that of typical males (e.g., Pl. 11B) which are as follows:—

After approximately fourteen days in formalin carapace predominantly light brownish purple with abundant lighter mottling, upper surface of appendages red purple with lighter mottling.

Carapace: Mottled with pale blue areas outlined in dark brownish purple. The most conspicuous light marks are reniform spots in each postlateral area continued as lines towards cardiac region. Distinct areas of spots and lines behind frontal and anterolateral borders, terminating between sixth and seventh anterolateral teeth. Gastric and cardiac regions clearly outlined with light blotches and lines, including a conspicuous W mark in gastro-cardiac boundary. Conspicuous light lines on inner portion epibranchial ridge, with further lines crossing borders of gastric region. Near lateral and posterior borders dense mottling.

Chelipeds: Upper surface of arm with fairly numerous white blotches, anterior surface indistinctly and transversely divided into blue upper distal half, and white lower proximal half, both halves with sparse dark blue spots. Upper and outer surfaces of wrist with large light blotches, under surface white. Upper surface of hand with moderate-sized light blotches and spots; outer surface between two upper carinae white with irregular purple meshwork and with pink and deep blue blotch at articulation of movable finger, lower portion white; inner surface between two upper carinae white with purple lines, between two lower carinae pale blue; under surface white externally and blue-purple with white spots internally. Fingers predominantly pink or white externally and pale blue internally, with upper proximal surface of movable finger with paler blotches.

Walking legs: Upper surfaces of meri with large white spots.

Fifth legs: Upper surfaces of merus and ischium densely blotched with white.

The most conspicuous colour differences of the unusual male are:

- (13) Darker background colour of carapace.
- (14) Reduced pattern of light markings on carapace.
- (15) Similar reduction on upper border of arm.
- (16) Sparser and larger light blotches on fifth leg.

## INTERMEDIATE SPECIMENS

Material comprised: 4 males (W2513, 145 mm; W2514, 179 mm; W2515, 152 mm; W2516, c. 184 mm, soft specimen without chelae or walking legs), trawled near Mud I., Moreton Bay by University Trawler "Wanderer II" (Mr. L. Wale), 20/x/1966.

Referring to tabulated features A. (1) – (12), and B. (13) – (16) of the previous section, the resemblances of the above specimens to the original unusual one are:—

W2513: (3), (5), (9), ?(10), (11), (12), (13), (14), (15). i.e. about 9 out of 16 features.

W2514: (1), (2), ?(4)\*, (5), (7), (8), (9), (11), (12), ?(15)\*. i.e. about 9 out of 16 features.

W2515: (2), (6), (8), ?(12). i.e. about 4 out of 16 features.

W2516: (1), (2), (3), (10), (11), (13), (14). i.e. about 7 out of 9† features.

It is evident that there is considerable gradation from unusual to usual specimens, and that there is no combination of features whereby the unusual specimens can be segregated.

## DISCUSSION

The existence of an almost continuous variation in local specimens of male *P. pelagicus* from an extreme form to "normal" has been demonstrated. Many (but not all) of the differences between the extreme and normal forms concern pigmentation, and presumably this is genetically determined, because specimens were of similar sizes, caught by similar techniques, all essentially in the same area. In some respects (e.g. features (13), (14) and (16)) colouration of the unusual specimens resembles that of *P. trituberculatus* (Miers) as figured by Sakai, 1939 (pl. 50) and particularly by Sakai, 1965 (pl. 54). There are, however still numerous colour differences as compared with *P. trituberculatus*.

In the closely related *P. sanguinolentus* (Herbst), the present author has shown that there are geographically distinct groups with noticeably different pigmentation, which probably have the status of subspecies. Comparison of males of *P. pelagicus* from Japan and Queensland has been effected through the loan of Japanese specimens by Dr. Yatsuzuka (figured by Stephenson in MS), and by comparison with Sakai's plates. These suggest that geographical differences occur in the pigmentation of male specimens of *P. pelagicus* as well as in *P. sanguinolentus*. Thus in Queensland specimens the central gastric light mark of Japanese specimens is absent or barely recognisable, while the postlateral and posterior portions of the carapace are noticeably more ocellated.

\* In W2514, features (4) and (15) agreed with the unusual specimen in the left cheliped, but not in the right.

† Only nine features visible on this incomplete specimen.

The figure and description given of *P. pelagicus* by Crosnier (1962, pp. 43–5, text-fig. 58) suggest yet another detailed type of patterning in Madagascar specimens, which possess in Crosnier's words (p. 45) "Nombreuses vermiculations claires". This has been confirmed by the examination of a recently preserved Madagascar male (123 mm) kindly provided by Dr. Crosnier. The patterning throughout shows many more pale rounded or polygonal areas on the carapace than in typical Queensland specimens, this applies particularly to the anterior mesobranchial and cardiac regions. The reniform spot in each postlateral area, while visible, has a much less obvious linear continuation towards the cardiac region.

In addition the ultimate segment of the male abdomen of Crosnier's specimen differs slightly from those of the Queensland specimens, somewhat resembling that of fig. 1D, but broader basally. Crosnier's figures of the first pleopod of a Madagascar specimen also differ slightly from those of Queensland material.

It is evident that it would be of considerable interest at the subspecific level to examine large numbers of specimens of *P. pelagicus* at different points within the Indo–West Pacific range of the species.

#### ACKNOWLEDGMENTS

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